Distinguishing Acute Aortic Syndrome from Myocardial Ischemia: A Case of Stanford Type B Aortic Dissection

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Abstract

Background: Acute aortic syndrome (AAS) is a progressive and life-threatening condition involving the aorta, with aortic dissection (AAD) being a primary manifestation. AAD occurs due to a tear in the intima of the aorta, which can result from either a primary intimal tear or medial hemorrhage. The peak incidence is observed in individuals during their 6th to 7th decade of life. The sudden onset of pain can mimic myocardial ischemia, presenting a diagnostic challenge when patients show ST-segment elevation on electrocardiography. Methods: We present a case involving a 65-year-old male who presented with sudden chest pain and ST-segment elevation on ECG, initially suspected to be myocardial infarction. Cardiac catheterization ruled out myocardial infarction. Further diagnostic imaging using trans thoracic echocardiography and computed tomography (CT) revealed a Stanford type B aortic dissection with associated intramural hematoma. Results: The CT scan confirmed the presence of acute intramural hematoma and aortic dissection. Initial management involved intravenous labetalol for blood pressure control, transitioning to oral antihypertensives after 24 hours. The follow-up CT showed a reduction in the hematoma. The patient's symptoms resolved, and he was discharged with instructions for close follow-up. Conclusion: AAS, including AAD and intramural hematoma, presents a significant diagnostic challenge due to its potential to mimic other acute conditions like myocardial ischemia. Timely and accurate diagnosis through advanced imaging is crucial for appropriate management. In this case, the successful differentiation of AAS from myocardial infarction and subsequent management improved patient outcomes. Clinicians should maintain a high level of suspicion for AAS in cases of acute chest pain, especially when ECG changes suggest myocardial ischemia, to ensure prompt and effective treatment.

Keywords: Acute aortic syndrome, aortic dissection, myocardial ischemia, intramural hematoma, diagnostic challenge

Significance | This case showed the critical need for differential diagnosis between acute aortic syndrome and myocardial ischemia to ensure timely and effective treatment.

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Introduction

Acute aortic syndrome (AAS) is a critical and life-threatening condition that encompasses a range of disorders including aortic dissection (AAD), intramural hematoma (IM), penetrating aortic ulcer, and aortic rupture. AAS is defined by the separation within the medial layer of the aortic wall, often resulting from an intimal tear, which can lead to catastrophic consequences if not promptly addressed (Bergmark et al., 2013; Corvera, 2016). The management and outcomes of AAS are heavily influenced by the classification systems used to categorize these conditions.

The Stanford classification system is commonly employed to classify aortic dissections. It categorizes dissections into Type A,

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which involves the ascending aorta regardless of the location of the primary intimal tear, and Type B, which involves the descending aorta without ascending aortic involvement (Vilacosta et al., 2021). This classification is crucial as it dictates the appropriate management strategy, with Type A dissections often requiring surgical intervention and Type B dissections generally managed medically (Nienaber & Clough, 2015).

Aortic dissection predominantly affects the ascending aorta, although it can also involve the descending aorta. Intramural hematoma, which is characterized by hematoma formation within the medial layer of the aortic wall without intimal injury, is a significant variant of AAS. Intramural hematomas are often seen in individuals in their fifth to sixth decades of life and are frequently associated with aortic aneurysms and severe atherosclerosis (Xie et al., 2014). They are less commonly observed in patients with Marfan syndrome. Studies suggest that intramural hematoma accounts for approximately 5–20% of all AAS or AAD diagnoses (Longe, 2008).

The diagnosis of acute aortic syndromes poses a challenge due to their diverse clinical presentations, which may overlap with other acute conditions such as acute coronary syndrome, gastrointestinal diseases (e.g., cholecystitis or pancreatitis), musculoskeletal disorders, and respiratory conditions (e.g., pulmonary embolism) (Akin et al., 2012). Accurate and timely diagnosis is essential for effective management. Imaging modalities such as computed tomography (CT) with intravenous contrast and magnetic resonance imaging (MRI) are considered gold standards in diagnosing intramural hematoma (Longe, 2008; Song, 2004). CT scans provide high sensitivity (95%) and specificity (85–100%), while MRI offers even higher diagnostic accuracy with 100% sensitivity and specificity (Kovalick et al., 2007).

Management strategies for acute aortic syndrome vary based on the type and severity of the condition. Acute dissections involving the ascending aorta are regarded as surgical emergencies and require immediate intervention (Harris et al., 2011; Vilacosta et al., 2021). In contrast, intramural hematomas confined to the descending aorta are generally managed with medical therapy, unless there is a high risk of end-organ ischemia or continued hemorrhage (Leone et al., 2018). Medical management for acute uncomplicated Type B dissections typically includes intensive blood pressure control, pain management, and potentially endovascular interventions (Lombardi et al., 2020). First-line treatments include beta-adrenergic antagonists such as esmolol, metoprolol, and labetalol, with additional use of vasodilators and calcium channel blockers as needed (Mulligan-Kehoe, 2010; Shiga & Ohara, 2009).

Acute aortic syndrome presents a significant diagnostic and therapeutic challenge due to its varied presentations and potential for rapid deterioration. A high level of clinical suspicion, combined with advanced imaging techniques, is crucial for the timely diagnosis and effective management of this critical condition (Bergmark et al., 2013; Zhao & Chen, 2011).

Case Report

A 65-year-old male presented with a sudden onset of severe chest pain, which radiated to his left shoulder and was accompanied by shortness of breath. An electrocardiogram (ECG) revealed ST elevations and biphasic T waves in leads V1 to V4. The patient's vital signs were notable for a blood pressure of 90/60 mmHg, a pulse rate of 62 beats per minute, and he was afebrile. Despite these concerning findings, cardiac catheterization showed no infarcts and was normal. Further investigation with trans thoracic echocardiography revealed an aortic dissection. A computed tomography (CT) scan confirmed the presence of an acute intramural hematoma and aortic dissection classified as Stanford type B.

The patient was initially managed with intravenous labetalol infusion to control blood pressure, aiming to maintain it below 120 mmHg. A follow-up CT scan performed 24 hours later showed a reduction in the intramural hematoma. Consequently, the patient's intravenous antihypertensive medications were transitioned to oral therapy, including labetalol and losartan. After a successful course of treatment and resolution of symptoms, the patient was discharged with instructions for close follow-up. The management strategy included intensive care unit monitoring, blood pressure control, and pain management, as intramural hematoma confined to the descending aorta is generally treated medically.

Ethics

This study adhered to the ethical guidelines established by the Declaration of Helsinki. Ethical approval for the publication of the case was obtained from the Institutional Review Board (IRB) of Bharath Institute of Higher Education and Research, with a focus on protecting patient privacy and confidentiality. Informed consent was secured from the patient, who was fully informed of the purpose and scope of the case report, including the use of medical data and images for educational and scientific purposes. The patient was assured that participation was voluntary and that anonymity would be maintained throughout the reporting process.

Results and Discussion

Acute aortic syndrome encompasses various critical conditions including aortic dissection (AAD), intramural hematoma (IM), penetrating aortic ulcer, and aortic rupture. It is defined by the separation within the medial layer of the aortic wall caused by an intimal tear (Bergmark et al., 2013). The classification systems for aortic dissection include the DeBakey and Stanford systems. The Stanford classification divides dissections into Type A, involving the ascending aorta, and Type B, involving the descending aorta without ascending aortic involvement (Corvera, 2016).

Risk factors for aortic dissection include hypertension, atherosclerosis, known aneurysms, Marfan syndrome, Loeys-Dietz syndrome, and Ehlers-Danlos syndrome (Xie et al., 2014). Dissections involving the ascending aorta are more common than those involving the descending aorta. Intramural hematoma, characterized by hematoma formation within the medial layer of the aortic wall without intimal injury, is often associated with aortic aneurysms and severe atherosclerosis. It is less frequently observed in patients with Marfan syndrome and accounts for approximately 5-20% of aortic syndrome or aortic dissection diagnoses (Nienaber & Clough, 2015).

Diagnosing acute aortic syndromes is challenging due to their diverse clinical presentations that may overlap with other acute conditions such as acute coronary syndrome, gastrointestinal diseases, musculoskeletal disorders, and respiratory conditions (Harris et al., 2011). CT and MRI are the gold standards for diagnosing intramural hematoma. CT scans provide high sensitivity and specificity, while MRI offers even higher diagnostic accuracy (Longe, 2008). In our case, the CT scan revealed a hyperattenuating crescentic thickening in the aortic wall, consistent with intramural hematoma.

Management strategies for acute aortic syndromes depend on the severity and type of the condition. Type A dissections are considered surgical emergencies, whereas uncomplicated Type B dissections, confined to the descending aorta, are typically managed with medical therapy unless there is a high risk of end-organ ischemia or continued hemorrhage (Vilacosta et al., 2021). Acute Type B dissections are treated with intensive blood pressure control, pain management, and potentially endovascular interventions (Halushka et al., 2016).

In this case, the patient was managed with aggressive blood pressure control using intravenous labetalol, followed by a transition to oral antihypertensive medications. Long-term therapy included ongoing hypertension management with a beta-blocker and an additional antihypertensive agent. The patient's follow-up care involves regular monitoring to ensure sustained blood pressure control and symptom management.

Conclusion

High clinical suspicion and timely diagnosis are crucial for managing acute aortic syndrome and preventing severe complications. Clinicians should maintain a high index of suspicion for aortic dissection in cases of acute chest pain, even when electrocardiogram changes suggest myocardial infarction. Prompt diagnosis and appropriate management are essential to improve patient outcomes and minimize the risk of adverse events.

Author contributions

V. R. S. and V. M. conceived the study and designed the research. S. B. P. and K. C. T. were involved in data collection and analysis. All authors discussed the results and contributed to the final manuscript.

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Competing financial interests

The authors have no conflict of interest.

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